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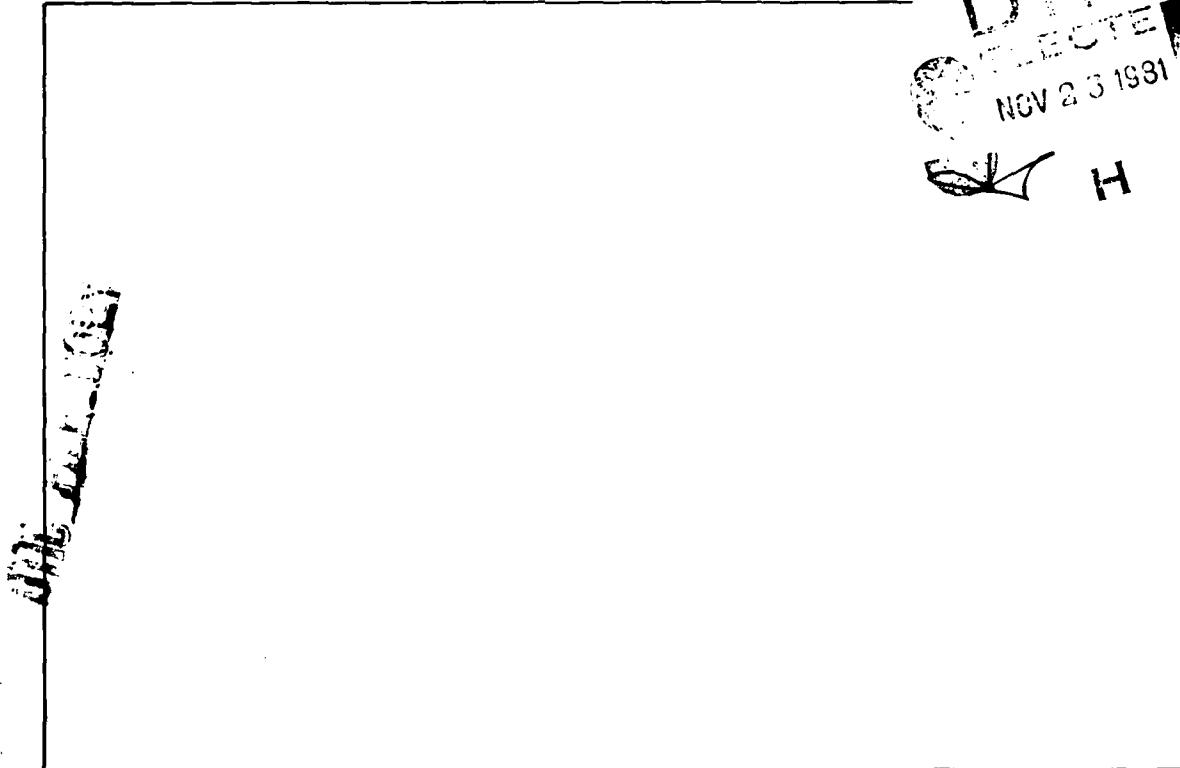
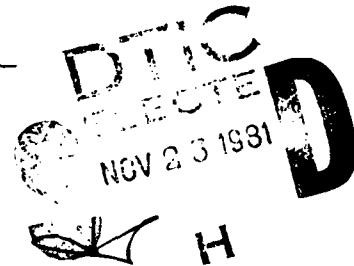
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ENVIRONMENTALLY COMPLIANT MUNITIONS RDT&E

by

Nicholas E. Berkholtz



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1981 Annual Meeting
Pyrotechnics and Explosives Applications Section
of the
American Defense Preparedness Association
Lawrence Livermore National Laboratories, California
3-5 November 1981

Environmentally Compliant Munitions RDT&E

by

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20. ABSTRACT (CONTINUE ON REVERSE SIDE IF NECESSARY AND IDENTIFY BY BLOCK NUMBER) THE PAPER FOCUSES ON THE IMPACT OF THE RECENT ENVIRONMENTAL PROTECTION LEGISLATION, NOTABLY THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) ON THE EXPLOSIVES LOADING AND TEST COMMUNITY. APPLICABLE US EPA REGULATIONS ARE REVIEWED, WITH CITATIONS FROM THE LITERATURE.		

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ABSTRACT

In past step ups in the pace of research, development, LAP or test activities, the primary questions were: "Can we do it quickly and safely?" In today's climate, the first question is: "Can we get the necessary permits from the several regulatory agencies so we can begin the RDT&E cycle?"

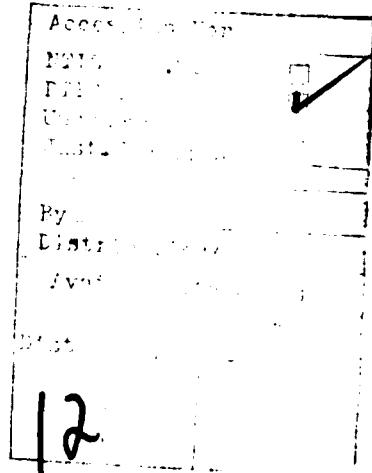
This paper illustrates the severe paperwork challenge that had to be met to get an armor-piercing penetrator round with tracer and cool burning propellant, and an electronically fuzed mine out of the lab to the proving ground.

A review of these dealings with the various agencies involved, the regulations invoked, the permits required, and the cradle-to-grave tracking associated with the hazardous materials, can provide some insight into the process itself and the long delays encountered. Success-oriented schedules generated by eager program managers rarely provide for sufficient time to cope with the regulatory prerequisites that are part of today's munitions business.

Our commitment to a clean environment requires that we identify the applicable legislative and regulatory requirements and find cost effective means to comply therewith.

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Explosives Safety

Safety regulations tend to arise from a big bang.

In the United Kingdom, regulations concerning the movement and storage of military explosives were initiated over 106 years ago, when in October 1874 a barge containing 5 tons of gun powder, black powder, as part of a train of 4 other barges loaded with grain, sugar, barrels of petroleum, and general cargo, being towed by a steam tug in a canal, exploded under a road bridge. The bridge disintegrated and the incident caused casualties and considerable damage in the neighborhood. Less than a year later, Parliament passed the Explosives Act of 1875 containing special legislative conditions for the manufacture, storage and conveyance of military explosives. (Ref. 1)

In the U.S., the impetus for explosive safety regulations followed the disaster at the Naval Ammunition Depot, Lake Denmark, NJ, on 10 July 1926. Overstocked magazines spaced closely together caused a chain reaction of explosions from one storage magazine to another, compounding the amount of property damage and the number of injuries and death. This set in motion a chain of events which brought about the establishment by Congress of the Ammunition Storage Board whose successor is the DOD Explosive Safety Board today. (Ref 2) Most of you are familiar with the safety regulations that have been promulgated in the intervening decades.

Environmental Protection

Environmental protection and enhancement in the United States prior to the late 1960's were due primarily to the actions of interested individuals, organizations, and various Government agencies having jurisdiction in environmental matters.

Degradation in environmental quality up to that point was due to general public apathy, increased population concentrations, and a lack of centralized direction of environmental policies and programs.

Oil spills from supertankers, the smog problem in Los Angeles, several air pollution episodes with hundreds of casualties in New York City, and the Love Canal fiasco, among other events, led to an increased awareness of the problem among the general population and in Congress.

This resulted in increasingly more comprehensive laws and a reorganization of the Federal structure for handling environmental problems.

Table I illustrates some of the legislation affecting the materials used in producing industrial goods and military materiel, in a truly cradle-to-grave fashion.

Safety Regulations

Those of you engaged in load, assemble, and pack operations are probably well aware of the numerous regulations affecting LAP operations.

The DOD Contractors' Safety Manual for Ammunition, Explosives and Related Dangerous Material (Ref. 3), The US Army Materiel Command; Safety Manual (Ref. 4), and PBM's System Safety Program for Modernization and Expansion Projects (Ref. 5) are key documents for the guidance of organizations in LAP activities.

Another set of requirements is handed down in the Occupational Safety and Health Act of 1970. Section 2(b) of this statute proclaims its objective: ". . . to assure so far as possible every working man and woman in the Nation safe and healthy working conditions. . . ." New

technologies developed since the industrial revolution have resulted in new worker dangers. The side effects of progress have been especially noticeable in the workplace. The consequences of unhealthy and unsafe working conditions place a burden on workers in terms of health and economic loss. Contemporary examples of health problems can be found in miners with black lung disease and workers with asbestosis. Currently, one out of four workers is exposed to some substance capable of causing death or disease.

The Occupational Safety and Health Administration (OSHA) (Department of Labor) was formed to be a focal point for worker safety and health. This agency develops standards and issues regulations related to occupational safety and health. It is their duty to inspect work environments for compliance with standards and regulations. OSHA also issues citations and proposes penalties for violations of standards and regulations.

An organization of the Department of Health and Human Services called the National Institute of Occupational Safety and Health (NIOSH) is related to OSHA. NIOSH has research responsibilities in support of OSHA.

OSHA has not always been well received or well implemented. Sometimes those regulations which have been enforced were not directly relevant to significant safety and health problems. OSHA management now appears to be trying to correct problems in this area. Recently, many of their published standards were withdrawn with the stated intent to better enforce those remaining.

Noise Abatement

OSHA, in 1970, adopted the industrial noise exposure standards which had been developed under the Walsh-Healey Act. These standards are intended to protect employees. EPA, in pursuing its responsibilities under the Noise Control Act, is not limited by the OSHA standards.

EPA has a responsibility to be concerned about the full-day exposure of the public, not just on-the-job noise. The problems of the complexity of formulating standards and regulations in the area of noise pollution and the normal conflicts between Federal bureaucratic agencies (EPA, OSHA, FAA, etc.) make it clear time and cooperation are essential to the success of noise pollution abatement.

But even R&D programs are faced with severe environmental problems. Some high performance cannon mounted on aircraft or even light ground vehicles generate muzzle blast over-pressures which damage adjacent surfaces. The use of muzzle brakes to reduce gun recoil momentum increases blast in the crew area, with some zones of fire, to unacceptable levels. (Ref. 6)

Current public concern regarding the environment has limited the operation of some proving grounds due to weapon noise signatures. A range of current research programs are underway, for example, at BRL and elsewhere, to address aspects of the muzzle blast problem. The references cited at the end of this paper highlight a few of the offerings from the literature in this field which is too broad to cover in a brief review paper.

TABLE I
LEGISLATION AFFECTING MATERIALS

Extraction	Mine Health & Safety Act of 1977 Surface Mining Control & Reclamation Act of 1977 Land Policy & Management Act of 1976
Refining	Clean Air Act of 1970 (amended 1977)
Processing	Water Pollution Control Act of 1972 (amended 1977) National Environmental Policy Act of 1975 [PL 91-190] [requires EIS]
Design	Design and Product Liability actions (strict tort reinterpretation)
Manufacture	Occupational Health & Safety Act of 1970 National Energy Act of 1978
Energy	Power Plant & Industrial Fuel Use Act of 1978 Energy Tax Act of 1978
Use	Consumer Product Safety Act of 1973 Noise Control Act of 1972
Recycling	Resource Recovery Act of 1970 Resource Conservation & Recovery Act of 1976
Disposal	Solid Waste Disposal Act of 1965 Toxic Substances Control Act of 1976 [PL 94-469] Comprehensive Environmental Response, Compensation & Liability Act of 1980

Changes in Environmental Protection Legislation

The thrust in our presentation will therefore be on some aspects of environmental legislative impact on the defense community based on our study of the literature and some involvement in securing permits needed to carry out LAP and testing operations by defense contractors.

Changes in existing and enactment of new environmental laws have occurred at such a rapid pace that only those immediately in the regulatory process or specialists in affected industries manage to remain informed. This presentation can in no way treat the subject comprehensively, but merely illustratively based on our limited knowledge.

Environmental Impact Statements under NEPA

Truly comprehensive assessment of the continuing environmental impact of a new military and industrial facility (or other significant construction activity) began with the enactment of the National Environmental Policy Act (NEPA). The Council on Environmental Quality within NEPA was created to provide a forum for ongoing assessment of efforts to achieve and maintain an acceptable environment.

One of the most far-reaching of all actions taken by NEPA was the establishment of the Environmental Impact Statement (EIS) as a prerequisite to any construction that might affect the environment.

Originally, such a formal, detailed assessment was required only for major federal activities that could have a significant effect on their surroundings. However, many states have followed suit and have developed their own requirements for EISs generally following the philosophy and implementation approach of the federal agencies. Thus, every new industrial, commercial or public-works project of any magnitude is today subject to a regulatory system that includes requirements for environmental impact statements, permits for construction and operation, and compliance monitoring and verification. This is true also for significant changes in the operation of existing plants.

Often, the environmental assessment is relatively simple, as indicated by the left-hand side of the Task Flow Diagram (Fig. 1). With a larger or more controversial project, the process is more complex, as indicated on the right-hand side of the diagram. (Ref. 7) In general, a formal EIS is required when one or more of the following is involved:

- .Potential for significant adverse effect on public health and welfare or degradation of the quality of life.
- .Destruction or alteration of a significant natural or historic resource.
- .Significant change in existing land-use patterns.
- .Significant change in population distribution.

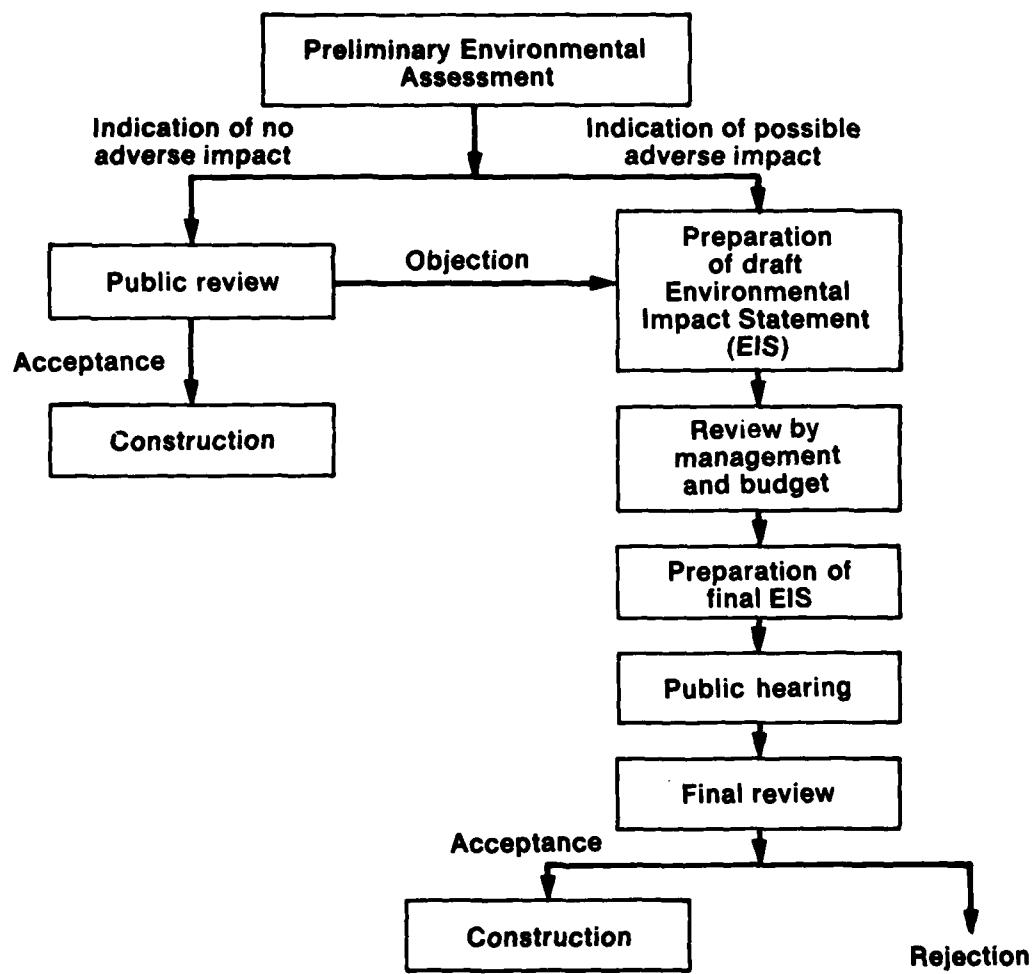


Fig. 1 Task flow diagram for environmental assessment

(Ref. 7)

.Significant impact on the maintenance and enhancement of the long-term productivity of the area's natural resources.

.Alteration of the ecological integrity of a significant element of the environment.

.Significant additional use of energy resources.

There are two aspects of EISs that have special relevance to major changes in operations or new industrial plantsite selection: the length of time required to obtain approval for the project to proceed, and the requirement for a public hearing. The preparation and approval of an EIA could take as long as two years, and may delay the approval and issuance of the various environmental permits involved. This timing can vary from one region to another, depending on the complexity of the environmental problems, and may thus strongly influence the desirability of a particular plantsite. (Ref. 7)

The requirement for a public hearing gives an opportunity for groups that may object to the proposed facility to air their views. This also informs the company of the identity of these groups and what their objections are. Knowledge of existing community attitudes may be an important factor in site selection.

Although there will be no actual preparation of environmental-permit applications until after a new site has been selected, consideration of the needed permits is important also for changes in operations of existing plants, for several reasons.

The whole permit picture is formidable, comprising an array of separate permits from various federal, state, regional and local regulatory bodies. The air permit situation is particularly complex, generally requiring multiple permits having different data requirements.

Environmental Permit Process

Although the principal environmental permits are based on Federal legislation and regulations, the state environmental agencies are the key factor, largely because they have been delegated the authority to enforce the federal regulations.

And local codes may be far more stringent than state codes. All efforts should be made to foster a climate of acceptance by local authorities and neighbors of a given type of plant and architectural design.

An investigation should be made into procedures for obtaining local building permits, and a schedule estimated for getting them. Some areas are notorious for the lengthy time required to obtain approvals. Such delays can retard construction schedules, and thus add to building costs by forcing construction into adverse weather conditions.

The two bar charts (Fig. 2 and 3) give a reasonable picture of the time it takes to prepare permits and obtain approval. Figure 2 represents a relatively optimistic situation, with only moderate environmental problems, efficient and competent regulatory agencies, and little controversy expected. Figure 3 shows a fairly pessimistic situation, with more-severe environmental problems, more-sensitive ecological areas, and considerable controversy generated by community groups. (Ref. 8)

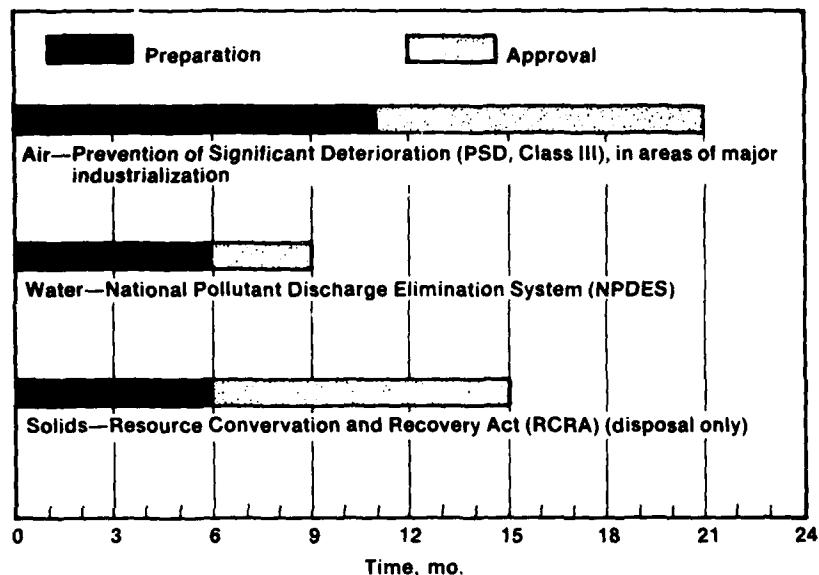


Fig. 2 Permit schedule: moderate environmental problems, relatively noncontroversial

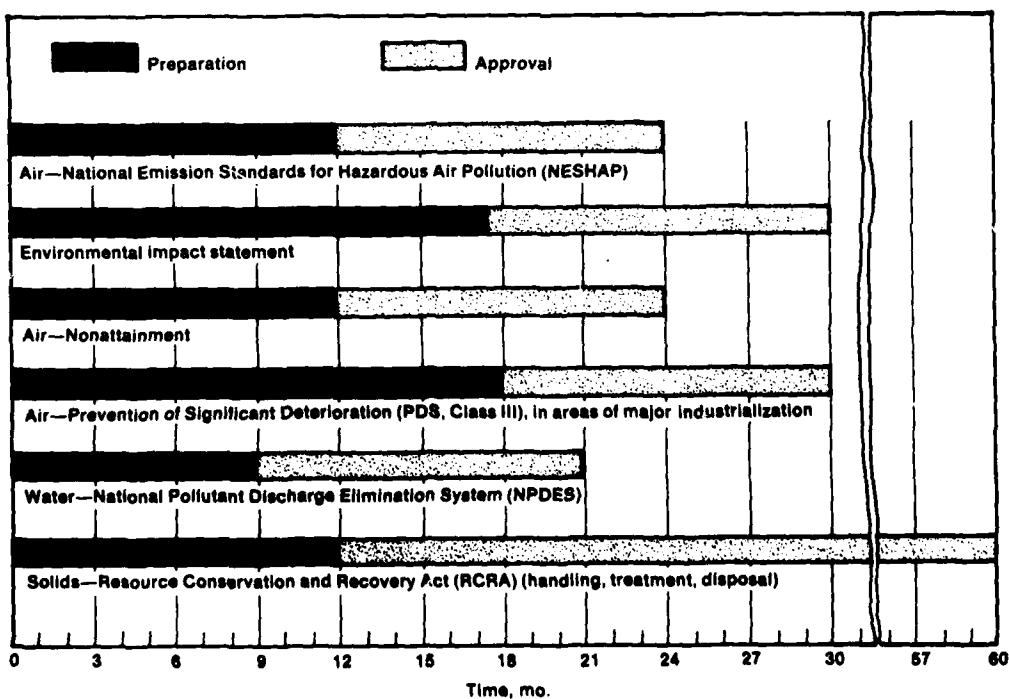


Fig. 3 Permit schedule: severe environmental problems, controversial (Ref. 7)

Consolidation of Environmental Protection under RCRA

Five years ago we had legislation to protect the air (Clean Air Act or CAA, as amended in 1977) and water (Clean Water Act or CWA, as amended in 1977), but no national controls for disposal of hazardous wastes. Then, in 1976, the Resource Conservation and Recovery Act (RCRA) was passed, as a reaction to imminent energy shortages and the increasing concerns over the disposal of municipal solid wastes and waste materials defined as hazardous. It strengthened the 1965 Solid Waste Disposal Act, the Resource Recovery Act of 1970, and the Toxic Substances Control Act of 1976.

Separate permits required for programs under the Safe Drinking Water Act (SDWA), Clean Air Act (CAA) and Clean Water Act (CWA) were consolidated with the RCRA permit program to streamline the regulatory process, eliminate redundant requirements, and ensure consistency among programs (Ref. 9). The inter-relationship among the various legislative acts under the jurisdiction of the U.S. Environmental Protection Agency is illustrated in Figure 4 (Ref. 10).

Impact of RCRA

RCRA represents a change in Federal policy relating to solid waste management from a limited role of research, development and supply of information to one of direct Federal involvement (Ref. 11).

In general, the statute

- .creates a major hazardous waste regulatory program;
- .prohibits the practice of open dumping of solid waste;
- .encourages state development of solid waste management plans;
- .provides grants and information programs; and
- .continues the Federal facilities program.

RCRA and the regulations promulgated thereunder by the EPA are designed to control hazardous wastes from cradle-to-grave, from generation and storage to ultimate disposal. The EPA estimates that there are in the United States: 67,000 generators,
5,000 transporters, and
26,000 facilities
involved with hazardous wastes (Ref. 9).

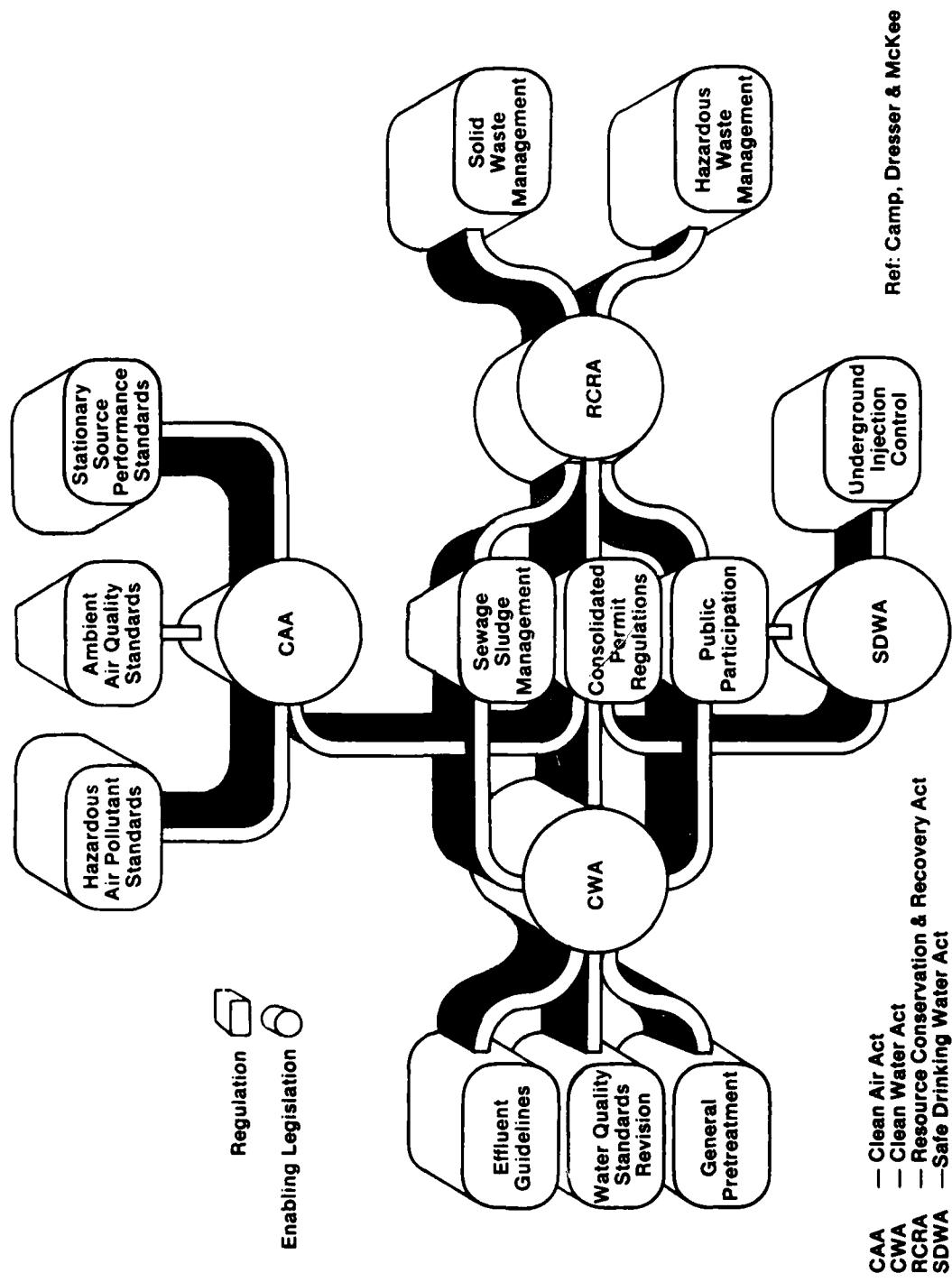


Fig. 4 Hazardous Waste Legislation & Regulations

Hazardous Waste Definitions

RCRA defines a hazardous waste in general as a solid waste that may cause increased mortality or serious illness, or may cause substantial hazard to health or the environment when improperly managed.

In its regulations, the EPA has adopted detailed technical specifications for four characteristics of hazardous wastes:

- .ignitability
- .corrosiveness
- .reactivity, and
- .toxicity.

In addition, the EPA defined as hazardous (on the basis of measurable characteristics for which standardized tests are available) 85 process wastes and 361 specific commercial products (122 of which are designated as acutely hazardous).

The generator of hazardous wastes must determine if the material is a "solid waste"; the waste or any constituent is included in the EPA's hazardous waste list; or the waste meets any of the hazardous waste characteristics.

According to Section 1004 (27) of RCRA: "The term solid waste means any garbage, refuse, sludge from waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities"

Responsibilities of Hazardous Waste Generators

The clock began ticking for the regulated community on 19 May 1980, when the EPA published the identification regulations in the Federal Register. All generators, transporters, and owners and operators of hazardous waste treatment, storage, and disposal (TSD) facilities were required to notify the EPA, by 18 August 1980, of their activities, describe the wastes they handle, and receive an identification number (EPA ID #).

In addition, all generators are required to use appropriate containers and label them properly, use only transporters who have an EPA identification number, and send their hazardous waste only to approved TSD facilities. They are also responsible for ensuring that their manifested wastes arrive at the designated TSD facility.

If waste is accumulated on a generator's property for more than 90 days, the generator then becomes a "storer" and must obtain a facility permit.

Transporters of Hazardous Waste

The regulations governing transporters were developed jointly by the EPA and by the Department of Transportation (DOT) (see Federal Register of 22 May 1980 for the revised DOT regulations).

Transporters of hazardous waste must notify the EPA, obtain an identification number, and comply with the manifest system and with DOT regulations regarding the reporting of spills and discharges.

Treatment, Storage and Disposal Facilities

All existing TSD facilities were required to notify the EPA by 18 August 1980 and obtain an identification number. They had to apply for a permit by 19 November 1980. If the EPA's requirements were met, TSD facilities may continue to operate until a final permit is either issued or denied. If a TSD facility deviates from the conditions stated in the permit application, the "interim status" of the facility will be cancelled.

Implementation of RCRA

The administrative or nontechnical standards of the EPA apply to all phases of the RCRA implementation program. These include waste analysis, inspection of facilities, security procedures, training of personnel, contingency plans, the manifest system, record keeping, and reporting.

The first phase of implementing RCRA began 19 May 1980 with establishment by the EPA of the structure for identifying what wastes are hazardous and how these are to be dealt with by the various facilities. Those regulations became law on 19 November 1980.

Phase II began in the fall of 1980 with the expansion of the current EPA regulation. Phase III will be the continuing process of refining and extending the EPA regulations.

Role of the States under RCRA

RCRA also provides for the EPA to pass on to the states environmental protection agencies the authority for enforcing hazardous waste handling regulations.

As of May 1981, 18 of the states have received interim authorization for their RCRA programs. Eight other states have sent completed drafts for RCRA implementation to the EPA; eight more have submitted draft applications, and the rest of the States and the several territories have not yet acted (Ref. 12).

The basic RCRA Legislation and the EPA regulations for implementation of the act released so far cover approximately 500 pages of text in the Federal Register. The Minnesota version of the state's implementation rules exceed 700 pages in its draft submitted to the EPA for approval (Ref. 13). Our discussion so far has addressed only the most important aspects of that legislation.

"Superfund" Legislation

To complement RCRA and provide the means for dealing with uncontrolled or improperly managed hazardous waste sites, such as the Love Canal, the Congress passed the so-called "superfund" act.

This legislation, the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Public Law 96-510), was signed by President Carter on December 11, 1980. Superfund was conceived from the need for a revolving fund that would allow EPA to go in and clean up hazardous waste sites first, then try to recover the costs of such cleanup later from the responsible parties. The legislation is structured to complement, not eliminate, existing laws governing hazardous waste and gives an incentive for responsible parties to voluntarily mitigate the damage from this waste. It is also designed to give the Government the resources

needed to clean up dump sites where the perpetrator is unknown; the perpetrator cannot be located, cannot afford to clean up, or declares bankruptcy and walks away from the site; or the responsible company was dissolved long ago. Further, it provides for the costs of a program to identify, investigate, and take enforcement and abatement action against releases of hazardous substances.

The superfund legislation provides for a \$1.6 billion fund over the fiscal year 1981-85 period for these purposes. It also provides that those who own or operate waste disposal sites, produce wastes, or transport them are liable for all cleanup costs and for up to \$50 million for each incident of damage to natural resources owned or controlled by State or Federal Governments. The act provides no compensation whatever to persons injured in such incidents, however. They must pursue compensation in the courts. The act also creates a new agency within the Public Health Service to be known as the Agency for Toxic Substances and Disease Registry, which shall report directly to the Surgeon General of the United States. Among other things, this new agency will be responsible for establishing and maintaining an inventory of literature, research, and studies on the health effects of toxic substances.

Initial Reactions of Industry

Both RCRA and the superfund legislation are too new to judge how effective they might be in cleaning up the environment, especially since the Congress has to allocate rather substantial funds for their implementation.

Some industry branches have been especially hard hit by the hazardous waste regulations. Electroplaters and businesses applying coatings and various surface finishes find their process waste streams automatically declared to be hazardous. Paint wastes, for example, were originally so classified by the EPA, but have since been removed from the list. It should be pointed out, however, that some state EPA rules, which were based on the original Federal guidelines, have not as yet been changed. For instance, the Ohio EPA still lists paint wastes as hazardous (Ref. 14).

Some electroplaters have successfully petitioned the EPA for delisting of their waste streams when appropriate tests and analyses showed that the resultant sludges did not meet the criteria of a hazardous waste. Such an approach is not always easy.

Complications in Enforcing RCRA

In a report to the House Oversight and Investigations Subcommittee, the acting Comptroller of the United States noted that hazardous waste sites pose investigation, evaluation, scientific, and legal problems (Ref. 15).

Not much is known about the possible adverse health and environmental effects associated with the thousands of hazardous waste disposal sites now being discovered throughout the United States.

The Environmental Protection Agency is finding it difficult to carry out its mandate to protect human health and the environment from hazardous wastes because:

--Old waste sites are being discovered faster than they can be investigated and evaluated.

--There is no strong scientific basis for determining risks.

--Legal action seeking correction of hazardous waste problems is pursued for only a few sites.

Individuals seeking relief within the courts to satisfy hazardous waste compensation claims face great difficulties.

New "superfund" legislation will provide some help, but it is too early to tell whether it will solve all of the problems presented by uncontrolled hazardous waste sites.

Conclusions

The LAP community has operated for decades under strict safety regulations. Explosives manufacturing and loading operations have a far better safety record than, for example, lumbering, coal mining, or farming.

A new trend in safety emphasis in the future will be aimed at reducing human exposure to noise. Some gun testing is already in jeopardy as being hazardous to firing crews.

The major emphasis in the last decade has, however, come in the area of environmental protection.

To the existing legislation to safeguard clean air and clean water the Congress has added a comprehensive act aimed at controlling solid wastes, especially hazardous solid wastes, which, by EPA's definition may actually also be semi-solid, liquid or entrapped gas.

This new legislation, RCRA, provides for cradle-to-grave tracking of hazardous wastes, streamlines the permit issuance under the several environmental protection acts, and will ultimately delegate to the States the enforcement of these new laws and their implementation regulations.

Since explosive loading and testing inevitably produce some hazardous wastes, few of us will escape the need to register our operations with the EPA to obtain the necessary permits.

The full effect of RCRA has not yet been felt since it took effect only recently, but the watchdog of Congress, the General Accounting Office has already pointed out investigative, evaluation, scientific, and legal problems posed by the hazardous waste sites.

This paper attempted to highlight some of these areas for you, reflecting our experience in discovering the provisions of this rather complex legislation relative to some of the work we are performing in the ordnance field. The reference list reflects many open literature sources that you may find of interest.

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